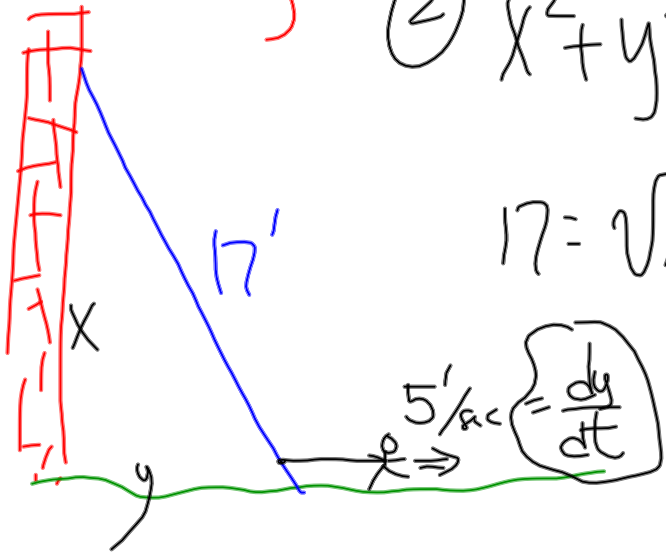
3.7/16



$y = 15$ $8^2 + y^2 = 17^2$

② $x^2 + y^2 = 17^2$

$17 = \sqrt{x^2+y^2}$

when $x = 8$ what is $\frac{dx}{dt}$?

③ $x^2 + y^2 = 17^2$

$2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$

④ $2(8)\frac{dx}{dt} + 2y(+5) = 0$

$16\frac{dx}{dt} + 2(15)(5) = 0$

$\frac{dx}{dt} = -\frac{150}{16}$ ft/sec

$17 = \sqrt{x^2+y^2} = (x^2+y^2)^{1/2}$

$0 = \frac{1}{2}(x^2+y^2)^{-1/2}\left(2x\frac{dx}{dt} + 2y\frac{dy}{dt}\right)$

$0 = \frac{1}{2}(17^2)^{-1/2}\left(2\cdot 8\frac{dx}{dt} + 2(15)(5)\right)$

$-150 = 16\frac{dx}{dt}$

5.1 / 26 $\quad y = x^2 \ln x \quad$ domain $x > 0$

$$y' = 2x\ln x + \frac{x^2}{x} = 2x\ln x + x$$
$$= x(2\ln x + 1)$$

$y' = 0 \Rightarrow$

$x = 0$

$2\ln x + 1 = 0 \Rightarrow \ln x = -\frac{1}{2} \Rightarrow x = e^{-1/2}$

$x(2\ln x+1)$

$-1 \quad 0 \quad .1 \quad \frac{1}{\sqrt{e}} \quad 1$ $\qquad - - - \quad + + +$

dec: $\left(0, \frac{1}{\sqrt{e}}\right]$

inc: $\left[\frac{1}{\sqrt{e}}, \infty\right)$

$$y' = x(2\ln x + 1)$$

$$y'' = (2\ln x + 1) + x\left(\frac{2}{x}\right) = 2\ln x + 1 + 2$$
$$= 2\ln x + 3 = 2\left(\ln x + \frac{3}{2}\right)$$

$y'' = 0 \Rightarrow$

$\ln x = -\frac{3}{2} \Rightarrow x = e^{-3/2} = \frac{1}{e^{3/2}}$

S.C.

$2\left(\ln x + \frac{3}{2}\right)$

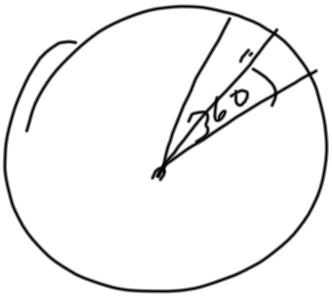
$0 \quad .1 \quad \frac{1}{e^{3/2}} \quad 1$ $\qquad - - - \quad + + + + +$

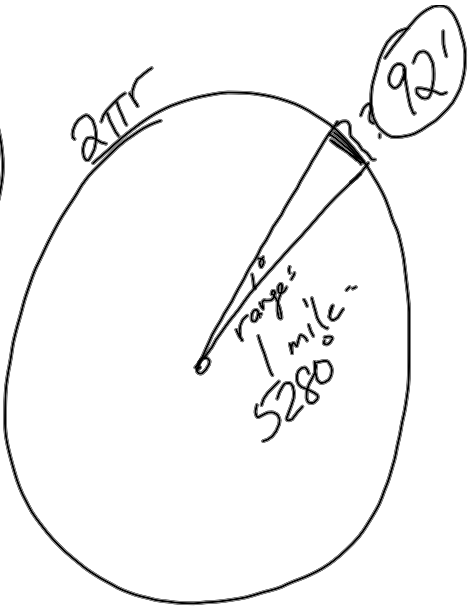
c-up $\left(\frac{1}{e^{3/2}}, \infty\right)$

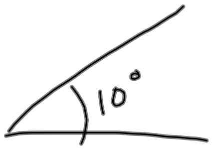
c-dn $\left(0, \frac{1}{e^{3/2}}\right)$

pt of infl: $x = \frac{1}{e^{3/2}}$

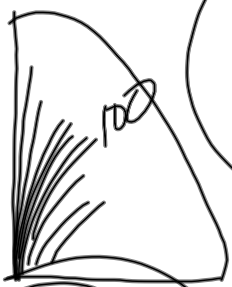
Radians







$$\frac{1^\circ}{360^\circ} = \frac{\text{little}}{2\pi r}$$



400 grads

$1^\circ = 60$ min

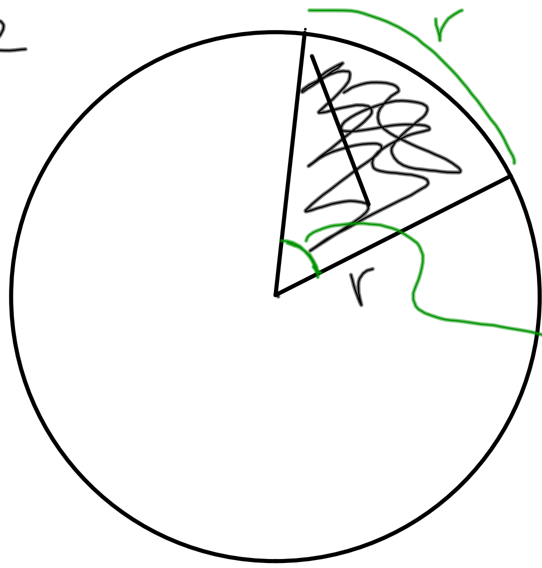
$60'$

1 min = 60 seconds

$= 60''$

$A = \pi r^2$

$C = 2\pi r$



$\frac{2\pi r}{r} = 2\pi$ radians in a circle

1 radius angle

1 RADIus ANgle

$$2\pi^{\text{radians}} = 360^\circ$$

$$\pi^{\text{radians}} = 180^\circ$$

$$60^\circ = \frac{60}{180} \cdot \pi = \frac{\pi}{3}$$

$$\frac{\pi}{8} \cdot \frac{180^\circ}{\pi} = \frac{180}{8} = \frac{90}{4} = \frac{45}{2} = 22.5^\circ$$

3.7/14

$\frac{dV}{dt} = 3 \frac{ft^3}{min}$

$\frac{dd}{dt}$ when radius $= 1$ ft

(2) $V = \frac{4}{3}\pi r^3$

(3) $\frac{dV}{dt} = \frac{4\pi}{3}\left(3r^2 \frac{dr}{dt}\right)$

$\frac{dV}{dt} = 4\pi r^2 \frac{dr}{dt}$

(4) $3 = 4\pi \frac{dr}{dt}$

$\therefore \frac{dr}{dt} = \frac{3}{4\pi}$

$d = 2r$

$\frac{dd}{dt} = 2\frac{dr}{dt}$

$\frac{dd}{dt} = 2\left(\frac{3}{4\pi}\right) = \frac{3}{2\pi}\ ft^3/min$

51/24 $y = xe^{x^2}$

$$y' = (1)e^{x^2} + x(2xe^{x^2})$$

$$= e^{x^2}(2x^2+1)$$

$\neq 0$ $\neq 0$

\+ + + + + + +

inc always

$$y' = e^{x^2}(2x^2+1)$$

$$y'' = (2xe^{x^2})(2x^2+1) + (e^{x^2})(4x)$$

$$= 2xe^{x^2}\left[2x^2+1+2\right]$$

$$= 2xe^{x^2}\left[2x^2+3\right]$$

$x = 0$ $\neq 0$

\- - - - - - | + + + +

c-up $(0, \infty)$

c-dn $(-\infty, 0)$

POI: $x = 0, y = 0$

even exponent Jawn $\frac{-x}{+} = 0$

$2x^3+3=0$ $2x^2-3=0$

$x=-\sqrt[3]{\frac{3}{2}}$

$2x^2=3$

$x^2=\frac{3}{2}$

$x=\pm\sqrt{\frac{3}{2}}$

5.1/26 $y = x^2 \ln x$ $\quad \underline{x > 0}$

$$y' = (2x)(\ln x) + (x^2)\left(\frac{1}{x}\right)$$

$$= 2x\ln x + x = x(2\ln x + 1)$$

$$= 0 \ldots$$

$\log_e x = -\frac{1}{2}$

$e^{-1/2} = x$

$$x = 0 \text{ or } 2\ln x + 1 = 0$$

$$\ln x = -\frac{1}{2}$$

$$x = e^{-1/2} = \frac{1}{\sqrt{e}}$$

$x(2\ln x + 1)$

$- - - \mid + + +$

$-1 \quad 0 \quad .1 \quad \frac{1}{\sqrt{e}} \quad +1$

inc: $\left[\frac{1}{\sqrt{e}}, \infty\right)$

dec: $\left(0, \frac{1}{\sqrt{e}}\right]$

$$y' = x(2\ln x + 1)$$

$$y'' = (1)(2\ln x + 1) + x\left(\frac{2}{x}\right)$$

$$= 2\ln x + 1 + 2 =$$

$$2\ln x + 3 = 0$$

$$\ln x = \frac{-3}{2} \cdots\to x = e^{-3/2} = \frac{1}{e^{3/2}}$$

$- - - \mid + + + +$

$0 \quad .01 \quad \frac{1}{e^{3/2}} \quad 1$

c-up: $\left(\frac{1}{e^{3/2}}, \infty\right)$

c-dn: $\left(0, \frac{1}{e^{3/2}}\right)$

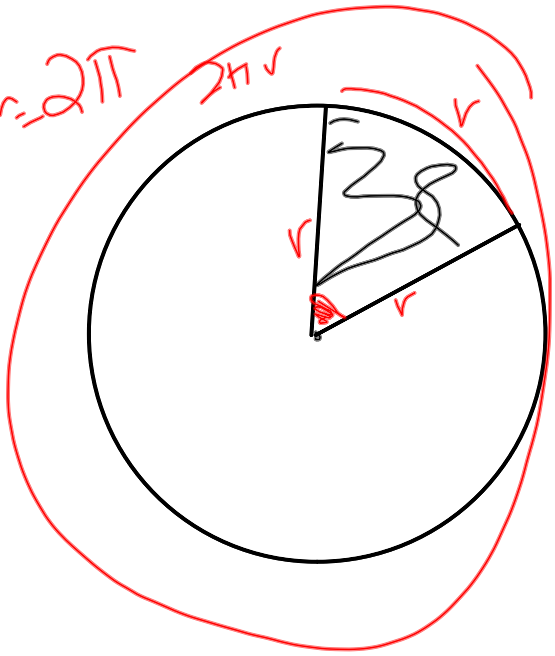
POI: $x = \frac{1}{e^{3/2}}$

$$\frac{1^\circ}{360^\circ} = \frac{\text{length}}{2\pi r}$$

$1^\circ = 60$ min $= 60'$

1 min $= 60$ seconds $= 60''$

$\frac{2\pi r}{r} = 2\pi$



radius angle =

RADIus
ANgle

whole circle: $\frac{2\pi \text{ radians}}{360^\circ} = \frac{\pi \text{ radians}}{180^\circ}$

$$\frac{60^\circ}{180^\circ}\pi = \frac{\pi}{3} \text{ radians}$$

$$90 = \frac{180}{\pi}\,\frac{\pi}{2} \text{ radians}$$

$$\frac{f^{x}}{f'^{x}} + \frac{f}{f'}$$